

REMARKS/ARGUMENTS

By virtue of the present amendment, claims 67-84 have been added to this application. Claims 67-83 have been copied verbatim from claims 1-17 of U.S. Patent No. 6,290,865 which issued on September 18, 2001 to Applied Materials, Inc (Exhibit A hereto). In addition, claim 84 has been added as one of the proposed counts for the interference to be declared. Applicants respectfully request that the Patent and Trademark Office declare an interference between the present application and the Applied Materials '865 patent.

The Applied Materials' application was, on its face, filed November 30, 1998. The present application is related to a number of applications, one of which is Serial No. 09/041,901 filed March 13, 1998. Based on that filing date, applicants should be designated as senior party in the interference.

The present application clearly supports claims 1-17 of the Applied Materials '865 patent. In the following table, applicants refer specifically to the support contained in the present specification for each of the Applied Materials' patent claims:

New Claims	Specification of Present Application
67. (new) A method of removing a film of deposited metal material, comprising:	The present application discloses a method of removing a thin film such as copper from a semiconductor wafer, as described on page 1, ll. 20, <u>et seq.</u>

<p>(a) providing a substrate, wherein the substrate has a first surface and an opposing second surface, wherein one of the surfaces faces upward the other surface faces downward, and further wherein the substrate has the film of deposited metal material on at least the first surface and a portion of unwanted film of deposited material on the second surface; and</p>	<p>In carrying out that method, the present application describes the select treatment of a workpiece having a first side, an opposing side and a peripheral edge. As is described in the present specification and drawings, one of the surfaces faces downwardly for contact with treating solution. One of the sides has copper deposited on the surface which is removed from that surface. That operation is described on pages 3-5 of the present specification.</p>
<p>(b) rotating the substrate while simultaneously:</p>	<p>The present specification describes the rotation of the workpiece during the application of processing fluids to the surfaces thereof as described on page 5.</p>
<p>delivering a rinse fluid to the first surface, wherein the rinse fluid substantially prevents dissolution of the film of the first surface; and</p>	<p>The present specification describes utilizing an inert fluid to ensure that no dissolution of copper one side of the wafer is removed as set forth on page 27. That embodiment is described in further detail on page 35 of the present specification where an "aqueous rinse" is described.</p>
<p>delivering a dissolving fluid to the second surface without delivering the dissolving fluid to the first surface, thereby removing the material from at least the second surface.</p>	<p>The present specification also describes the use of an etchant functioning to dissolve, for example, a copper layer on the wafer to effect removal. Detailed directions of the removal are contained on pages 35-37.</p>

<p>68. (new) The method of claim 67, wherein the first surface faces upward and the second surface faces downward and delivering the rinse onto the first surface at a greater flow rate compared to a flow rate of the dissolving fluid delivered onto the second surface.</p>	<p>The present specification describes positioning the front side of the wafer downwardly and directing the rinse fluid to that side while the etchant is applied to the back side facing upwardly. See, for example, the present specification on pages 10-15. The specification describes controlling the extent to which the etching fluid is applied by controlling its flow rate. See, for example, page 5 of the present specification.</p>
<p>69. (new) The method of claim 68, wherein the rinse fluid comprises deionized water and the dissolving fluid comprises an acid.</p>	<p>The present specification describes a rinse fluid in the form of deionized water, as set forth on page 11. The dissolving fluid is described as an "acidic etchant" as represented by a number of acids as described on page 40.</p>
<p>70. (new) The method of claim 69, wherein the metal material comprises copper and the acid comprises hydrochloric acid.</p>	<p>The present specification describes copper as the metal to be removed at page 1 and hydrochloric acid as one potential acid at page 40).</p>

71. (new) The method of claim 67, wherein the first surface faces downward and second surface faces upward and delivering the rinse onto the first surface at a greater flow rate compared to a flow rate of the dissolving fluid delivered onto the second surface.	The present specification describes positioning the front side of the wafer downwardly and directing the rinse fluid to that side while the etchant is applied to the back side facing upwardly. See, for example, the present specification on pages 10-15. The specification describes controlling the extent to which the etching fluid is applied by controlling its flow rate. See, for example, page 5 of the present specification.
72. (new) The method of claim 67, wherein delivering a rinse fluid and delivering a dissolving fluid occurs independently of mechanical scrubbing.	The present specification, on pages 39-41, describes the use of a rinse fluid and a dissolving fluid. Because the dissolving fluid is described as an acid as set forth on page 40, that delivery occurs independent of any mechanical scrubbing as would be recognized by one of ordinary skill in the art.
73. (new) The method of claim 1, further comprising dissolving at least a portion of any film deposited on an edge of the substrate.	The present specification describes (e.g., page 11) the use of an etchant to remove copper from the "peripheral bevel edge" of the substrate.
74. (new) The method of claim 67, further comprising dissolving at least a portion of the film deposited in an edge exclusion zone of the second surface.	See the support for claim 73.

<p>75. (new) A method of removing a metal material deposited on the front side of a substrate and at least a portion of a back side of the substrate, comprising:</p>	<p>The present specification describes the removal of a copper film from both the front side of the substrate and selected portions of the backside. See, for example, page 11 of the specification.</p>
<p>(a) directing a non-etchant fluid onto the material deposited on the front side to substantially prevent dissolution of material on the front side; while simultaneously</p>	<p>The present specification describes utilizing an inert fluid to ensure that no dissolution of copper on one side of the wafer is removed as set forth on page 27. That embodiment is described in further detail on page 35 of the present specification where an "aqueous rinse" is described.</p>
<p>(b) dissolving at least a portion of the material deposited on the backside without dissolving the material on the front side</p>	<p>The present specification also describes the use of an etchant functioning to dissolve, for example, a copper layer on the wafer to effect removal. Detailed directions of the removal are contained on pages 35-37 of the present specification.</p>
<p>76. (new) The method of claim 75, wherein directing the fluid onto the material comprises using a chamber adapted to spin and rinse the substrate.</p>	<p>The present specification describes rotation of the semiconductor wafer during the rinse step. See, for example, pages 5 and 15 of the present specification.</p>

77. (new) The method of claim 75, further comprising processing the substrate with a chamber adapted to spin and rinse the substrate while in-situ dissolving the portion of the deposited material from the backside using an acid.	The present specification describes rotation of the semiconductor wafer during the rinse step. See, for example, pages 5 and 15 of the present specification.
78. (New) The method of claim 75, further comprising dissolving material deposited on an edge of the substrate.	The present specification describes (e.g., page 11) the use of an etchant to remove copper from the "peripheral bevel edge" of the substrate.
79. (new) The method of claim 75, further comprising dissolving the deposited material in an edge exclusion zone on the backside of substrate.	See the support for claim 78.
80. (new) The method of claim 75, wherein directing the fluid onto the material on the front side comprises rinsing the material on the front side.	The present specification describes rinsing the front side of the wafer as described, for example, on page 11.
81. (new) The method of claim 80, further comprising substantially preventing dissolution of the film on the front side by directing the rinsing fluid onto the front side at a greater flow rate compared to a flow rate of the dissolving fluid directed onto the backside.	The specification describes controlling the flow rates to selectively control dissolution of parts of the film on the front side. See, for example, page 5 of the specification as well as pages 10-12.
82. (new) A method of removing a film of deposited metal material, comprising:	The present application discloses a method of removing a thin film such as copper from a semiconductor wafer, as described on page 1, ll. 20, <u>et seq.</u>

<p>(a) providing a substrate, wherein the substrate has a first surface and an opposing second surface, wherein one of the surfaces faces upward the other surface faces downward, and further wherein the substrate has the film of deposited metal material on a least the first surface and a portion of unwanted film of deposited material on the second surface; and</p>	<p>In carrying out that method, the present application describes the select treatment of a workpiece having a first side, an opposing side and a peripheral edge. As is described in the present specification and drawings, one of the surfaces faces downwardly for contact with treating solution. One of the sides has copper deposited on the surface which is removed from that surface. That operation is described on pages 3-5 of the present specification.</p>
<p>(b) providing means for, rotating the substrate while simultaneously:</p>	<p>The present specification describes the rotation of the workpiece during the application of processing fluids to the surfaces thereof as described on page 5.</p>
<p>delivering a rinse fluid to the first surface, wherein the rinse fluid substantially prevents dissolution of the film on the first surface; and</p>	<p>The present specification describes utilizing an inert fluid to ensure that no dissolution of copper one side of the wafer is removed as set forth on page 27. That embodiment is described in further detail on page 35 of the present specification where an "aqueous rinse" is described.</p>
<p>delivering a dissolving fluid to the second surface without delivering the dissolving fluid to the first surface, thereby removing the material from at least the second surface.</p>	<p>The present specification also describes the use of an etchant functioning to dissolve, for example, a copper layer on the wafer to effect removal. Detailed directions of the removal are contained on pages 35-37 of the present specification.</p>

83. (new) A method of removing a metal material deposited on the front side of a substrate and at least a portion of a back side of the substrate, comprising simultaneously:	The present specification, particularly on page 35, describes the simultaneous delivery of etchant and inert liquids to the wafer as called for by the preamble to the claim.
(a) steps for directing a non-etchant fluid onto the material deposited on the front side to substantially prevent dissolution of material on the front side; and	The same page of the specification describes the use of a non-etchant fluid to prevent etchant intrusion onto that side of the wafer.
(b) steps for dissolving at least a portion of the material deposited on the backside without dissolving the material on the front side.	Page 35 of the specification also describes the selective removal of back side film deposits without affecting deposits on the front side.

As can be seen from the foregoing, the specification of the present application fairly supports each of claims 1-17 of the Applied Materials '865 patent.

Applicants suggest that the interference declared between the present application and the Applied Materials '865 patent be constructed to contain two separate counts. Both would be directed to a method for removing metal from a substrate such as a semiconductor wafer. One would make no reference to rotation of the substrate during processing; the other would be directed to a method including rotation as part of the processing steps. Applicants believe that the two processes are patentably distinct. As the present specification explains, rotation of the wafer exhibits unusual and unexpected effects on the distribution of fluids on the face of the wafer. For that reason, applicants believe that the two processes, one with rotation and one without rotation, are patentably distinct.

The count of the interference, as the Examiner is aware, should correspond to the broadest claim patentable to both parties. Since Applied Materials has a patent to be involved in this interference, however, the count can be no narrower than the broadest claim of the Applied Materials patent. Examining the '865 patent claims, applicants believe that claim 17 is perhaps the broadest claim in the patent. It does not expressly call for rotation and essentially claims two steps in which, in a first step, a non-etchant fluid is directed to the front side of the wafer to prevent removal or dissolution of material on that side of the wafer. In the second step, a portion of the material deposited on the back side is removed without dissolving material on the front side.

Applicants believe that claim 17 is therefore internally inconsistent. The preamble refers to removing a metal "deposited on the front side of a substrate" coupled with the removal of "at least a portion of a back side of the substrate". Thus, the preamble to the claim suggests that material is removed from both the front and back sides of the substrate while step (b), on its face, appears to contemplate removing a portion of the material on the back side "without dissolving the material on the front side".

To avoid that apparent inconsistency, applicants have submitted claim 84 which is based on claim 17 but which eliminates the inconsistency between the preamble and step (b) of claim 17. Claim 84 thus reads as follows:

84. A method of removing a metal deposited on at least one side of a substrate comprising simultaneously:

(a) the step of directing non-etchant fluid onto the metal deposited on one side of the substrate to substantially prevent dissolution of at least some of the material on said one side; and

(b) the step of dissolving at least a portion of the metal deposited on the other side of the substrate without dissolving all of the metal on said one side.

As the Examiner can see, claim 84 is broader than claim 17 and contemplates, as the present specification discloses in reference to Fig. 12A, that metal can be removed from one side of the wafer exclusively while protecting, with an inert fluid as one example, the other side from the effects of a removing fluid. Thus, claim 84 is fashioned like claim 17 but eliminates the inconsistency between the preamble and step (b).

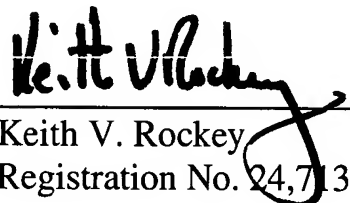
Claim 84, therefore, covers embodiments in which metal is removed, at least in part, on both sides of the substrate and the embodiment in which metal is removed exclusively from one side or the other. Applicants believe that claim 84 is patentable over the prior art for the same reasons that claim 17 of the Applied Materials '865 patent was found to be patentable over the prior art. Thus, applicants submit that one count of this interference should be formulated as a phantom count based on claim 84 presented herein. Claims 9-15 and 17 of the Applied Materials '865 patent should be designated as corresponding to the count.

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As the second count, applicants suggest that the count be based on claim 1 of the Applied Materials '865 patent which includes the step of rotating the substrate while simultaneously delivering a rinse fluid and a dissolving fluid. As the Examiner will note, claim 1 does not raise the inconsistency noted respecting claim 17 (and claim 9 as well). The remaining claims of the Applied Materials '865 patent should be designated as corresponding to that count, namely claims 1-8 and 16.

Accordingly, applicants respectfully request the declaration of an interference at the earliest possible opportunity.

Respectfully submitted,



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